Characteristics and Outcomes of Acute Exacerbation of Chronic Obstructive Pulmonary Disease Admissions in Intensive Care Units in Manitoba

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RATIONALE

Chronic Obstructive Pulmonary Disease (COPD) affects approximately 8% of the population and many people remain undiagnosed.[1] Currently the fourth leading cause of death in Canada,[2] COPD carries with it significant morbidity and mortality. COPD carries a large economic burden and in 1998 the cost to the Canadian Healthcare System was estimated at 1.87 billion.[3]

Admission to the intensive care unit (ICU) with an acute exacerbation of COPD (AECOPD) carries a particularly high mortality rate, with reported rates ranging from 17-60%.[4,5,6] Improving the understanding of characteristics associated with morbidity and mortality of AECOPD in the ICU is useful for risk stratification and prognostication of these patients.

OBJECTIVES

1. Determine the number of hospitalizations for AECOPD in Winnipeg, Manitoba ICUs.

2. Examine rates of non-invasive positive pressure ventilation (NIPPV) failure, number of intubated days, length of stay and ICU mortality rate.

3. Identify patient characteristics associated with increased mortality.

METHODS

Data Collection

Any admission to the ICU between January 1st 2004 and December 31st 2009 with the Primary Diagnosis of COPD, Emphysema or Bronchitis was included. Data from the Winnipeg Critical Care database was collected on demographics, comorbidities, ventilation, laboratory parameters, medication utilization and outcomes. The Winnipeg Critical Care database is a prospectively maintained, electronic database of all patients who are admitted to any of the eleven ICU's in Winnipeg, Manitoba. Detailed information, including, demographic data, illness severity indicators, daily TISS scores (to quantify ICU interventions) and in hospital mortality, is collected throughout the admission. The database tracks patients from ICU admission to death or ICU discharge.

Data Analysis

Descriptive statistics using mean, median and proportions were used for describing characteristics of the study population. NIPPV failure was defined as requiring intubation after initiation of NIPPV. Mortality analysis was done using multivariable logistic regression and a p value <0.05 was considered significant. If there was more than one admission per individual during the study period, only the last ICU admission was included in the mortality analysis.

Chart Review

A subset of 28 charts were selected for review using an online random number generator, in order to confirm the admission diagnosis of AECOPD. Clinical documentation of increased dyspnea, cough, sputum volume and/or sputum purulence was also recorded.

RESULTS

Study Population

There were 31 682 total admissions to the ICUs between January 1st 2004 and December 31st 2009.

782 patients were identified with 1017 admissions for AECOPD (3.2% of all ICU admissions) during the study period.

Table 1. Patient Characteristics

VARIABLE	RESULT
Male	478 (47%)
Age [mean (SD)]	68.5 years (± 11.7)
APACHE II [mean (SD)]	18 (± 6)
Charlson [mean (SD)]	2.8 (± 1.7)
Prior ICU admission	60 (6%)
Co-existing Pneumonia	434 (43%)
Treated with bronchodilators	951 (94%)
Antibiotics administered	794 (78%)

Table 2. Mode and Outcomes of Ventilatory Support

VARIABLE	RESULT
NIPPV	425 (42%)
Days on NIPPV [median (IQR)]	1.5 days (1-3)
NIPPV Failure	35 (8%)
Intubated	650 (64%)
Extubation Failure	49 (7%)
Days Intubated [median (IQR)]	3.3 days (1.8-6.9)

Outcomes

Median ICU length of stay was 4.5 days (IQR 2.3 – 7.7).

ICU mortality was 11.1%.

75% (65/87) of deaths were associated with withdrawal of care.

Table 3. Mortality Analysis

CHARACTERISTIC	ODDS RATIO*	P VALUE
Age	1.04 (95% CI 1.01-1.06)	0.02
Male	1.35 (95% CI 0.81-2.23)	0.25
APACHE II	1.16 (95% CI 1.11-1.21)	<0.0001
Charlson	0.92 (95% CI 0.79-1.07)	0.29
Prior ICU admission	0.55 (95% CI 0.18-1.74)	0.31
NIPPV Failure	2.89 (95% CI 1.15-7.25)	0.02
Extubation Failure	2.22 (95% CI 0.98-5.05)	0.06
PaCO$_2$ on ABG	1.01 (95% CI 1.00-1.02)	0.21

*Odds Ratios are adjusted for each of the characteristics listed in Table 3.

Chart Review

28 charts
- 24 confirmed AECOPD
  - 21 documented increased dyspnea, cough and/or sputum
  - 2 chart volumes unavailable
  - 1 tracheobronchitis
  - 1 TB pleural effusion (initially treated as AECOPD)
- 4 unconfirmed

LIMITATIONS

1. This is a retrospective study and therefore limited for collecting variables such as medication use, treatments and laboratory parameters.

2. We are relying on database coding for admission diagnosis.

3. We are unable to determine mortality for patients transferred out of teaching medicine wards.

4. We are unable to define parameters for interventions (ex: intubation/ extubation).

CONCLUSIONS

Age, APACHE II score and NIPPV failure were significantly associated with increased mortality. Interestingly, previous admission the ICU and Charlson score were not associated with higher mortality.

Mortality rate in our study was lower than that reported in some studies of AECOPD in the ICU. This may be related to a lower mean APACHE II score.

Clinical prognostication of patients with AECOPD remains difficult. More research is required to guide clinical decision making.

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